knowledge at variance and bring about a vague query as to whether it is worth while to adopt any particular system of classification while zoological nomenclature remains liable to such changes. In view, however, of the general excellence of Dr. Stejneger's publication, these criticisms must be classed as quite superficial.

RAYMOND L. DITMARS
THE NEW YORK ZOOLOGICAL PARK

DISCUSSION AND CORRESPONDENCE

A PLAN OF PUBLICATION FOR AGRICULTURAL EXPERIMENT STATION INVESTIGATIONS

THE passage of the Adams Act marked a new era in the development of the agricultural experiment stations and is destined to exercise a great influence on the character of the investigations and the publications issued. The investigations carried on under the Hatch act, while largely scientific, have nevertheless, in the main, been of general character intended primarily to meet the immediate needs of farmers and orchardists.

When the stations were first established as a result of the Hatch Act, agriculture was in a chaotic condition, there being scarcely any available trustworthy literature. The first work of the stations was thus, naturally and properly, largely pioneer work. This work has been carried forward with energy and success and "scientific farming," so called, has been rescued from disrepute and established on a basis of trust and confidence. With the systematizing and advance of our knowledge and the development of a trained corps of scientific agricultural workers, the necessity for more profound research on agricultural problems has become more and more apparent. Station workers, heretofore, have generally been unable to undertake very extensive research on fundamental problems, owing to lack of funds, the demand for immediate information on lesser problems, routine duties in answering correspondence and the multitudinous duties incident to the work of organization and the promotion of agricultural knowledge. With the passage of the Adams Act, which is expected to be used exclusively for fundamental research, the character of the work will be largely changed and extensive experiments will be carried out on the fundamental problems of agriculture, which will not have in view their immediate practical value. Heretofore the bulletins published in the series of the various stations have been largely of practical nature and adapted to the immediate needs of agriculture. True, very many bulletins have been published containing excellent scientific matter, but these were largely out of place in the regular series of bulletins as maintained by the stations. In several stations scientific and technical series of bulletins were started to accommodate such scientific papers which were not suited for general distribution. Owing to the confusion in quoting such publications and other reasons, all such special series have, I believe, been discontinued.

As a result of the Adams Act there is certain to be many bulletins prepared in the near future of purely scientific nature, which will not be satisfactory for publication in the regular series of station bulletins. It behooves station authorities, therefore, to carefully consider the means of publication and devise some satisfactory method which will meet the present requirements and provide for future needs. The writer has given this matter considerable thought and desires to suggest the plan described below for consideration.

The writer would suggest the establishment of a series of agricultural journals or memoirs to be edited and published under the direction of the Association of Agricultural Colleges and Experiment Stations. The field of agricultural research could be divided up and a separate series maintained for each division, as, for instance, a separate series for each of the following subjects:

Agronomy,
Horticulture,
Plant Pathology,
Plant Physiology and Anatomy,
Plant Biology and Breeding,
Soil Investigation,
Dairy Investigation,
Animal Husbandry,
Poultry Investigation,
Animal-breeding,

Animal Pathology,
Entomological Investigation,
Etc.

As a method of handling such publications an editing committee of three station workers could be appointed by the association for each subject, who would examine, edit and pass on the suitability of papers submitted for publication in the scientific journals. Papers for publication could be forwarded direct to the chairman of the proper committee by the directors of the various stations and in case the committee considered them unsatisfactory for publication in the journal, they could be returned to the director of the station with the recommendation that they be published in his regular series of station bulletins or remodeled to fit them for publication in the journal.

Such journals, if established, the writer believes, should not be distributed free of cost except possibly a single set to the library of each station, and to the Department of Agriculture and the Congressional Library. Aside from these a regular price per volume should be charged for subscription as is done for standard periodicals.

The funds from subscriptions would in considerable measure pay for the expense of publication. Each station should probably pay a certain limited annual stipend for regular maintenance and privilege of participation in the enterprise, and after the above funds are exhausted, any deficit at the end of the year could be assessed against the stations publishing articles during the year, in proportion to the pagation published. In this way the publication could be easily financed and probably at less expense than any station could now publish and distribute similar articles which are sent gratis.

This scheme of publication if put into operation would necessitate the employment of a business manager and assistants and the establishment of a headquarters from which all arrangements for publication and distribution could be made. This office, however, should exercise no function except as related to the business of publication.

Many important reasons can be assigned why some such scheme of publication as the above should be put into operation. The writer assumes that it must be clear to every one that some different source of publication from those now existing in the stations must be provided.

Purely technical papers on the cytology of heredity or on soil bacteriology, for instance, while of the utmost fundamental value might, if published in the regular series of station bulletins, be actually ridiculed and bring a station into disrepute with certain classes of their constituents. In any case such technical papers intended for specialists have no place in our present series of bulletins, which are intended for general distribution, and would be largely lost to the people for whom they are intended, when published in such a place.

It may be argued that the time has now come when each station should publish a separate scientific or technical series of bulletins. I would answer that the scientific publications of any one station will not be sufficient in number to attract special notice and justify the publication of a special series, and even if this were the case it would be a poor place to publish such matter, where all subjects are run together in one series, and considering the number of stations publishing. What all writers and stations desire is to place their good matter where it will receive the most attention and be most easily preserved and found. Every one knows from experience, that the literature which is always preserved and most easily accessible is that found in standard periodicals which are issued in volumes and indexed. If special journals were established for the different important subjects, investigators would know immediately where to look for articles on any particular subject. They could subscribe for and receive regularly the journals representing the subjects in which they are especially interested and would know when they had looked over all of the available experiment-station literature on a given subject. I am something of a plant-breeder, yet I do not

doubt that some rather important matter on breeding has been issued by some of our experiment stations which I have not seen. If, however, we had a journal of plant-breeding in which every breeder in the experiment stations would describe in full or at least in summary his important results, I could soon look over that journal and feel confident of knowing what had been accomplished by the experiment-station workers.

Purely scientific articles could be published, possibly in some of the existing scientific journals, but these will not meet the requirements. The station is given public funds for conducting investigations and it would seem necessary that they have a recognized place of publication. They can not be altogether dependent on private sources of publication. Many articles in any case will find their way to established scientific periodicals and a liberal amount of such publications should, the writer believes, be encouraged. He feels, however, that it is absolutely necessary to have distinctive publications for the stations which will represent their work.

A modification of the above plan which might more nearly meet the views of some persons would be to publish separate bulletins numbered consecutively under each series or subject, *i. e.*, Agronomy Bulletins, 1, 2, 3, etc., or Dairy Industry, 1, 2, 3, etc. Similar to the publications of the Carnegie Institution, except classified under different subjects so that it would not be so difficult to determine what had been published on a given subject. Each bulletin in this case to be sold separately. While there are many points in favor of such separate publication and sale, the writer believes that all things considered, a periodical publication which can be subscribed for by the volume meets more of the requirements. The writer has submitted the substance of this paper to several of his colleagues for criticism and suggestions. In a letter regarding the matter, Director L. H. Bailey states:

I have gone over your proposition for a series of publications and I like it very much. . . . I feel that the series should have unity and solidarity. Rather than to have the series of journals I think there ought to be one series of memoirs, perhaps broken up into parts representing the different subjects. These parts could be published separately. References then could be made to the memoirs as a whole with a designation as to Botany series, Plant Breeding series, Poultry series, and the like, much as is done at the present time with the Annales des Sciences. The assessment against the institutions for such publication could not be made against the Adams Fund, as that can not be used for publication. I suspect that most of the institutions already mortgage their Hatch Fund for publication as heavily as they ought. However, I am sure that some way could be found whereby the money could be secured.

Doctor T. L. Lyon writes as follows:

I have looked over the plan you propose for publishing the technical results obtained by the several experiment stations. This strikes me as an extremely good plan and I see no reason why it could not be put into execution. I should like to make one suggestion that I think might make the plan work a little more smoothly. I notice that you provide for expense of publication by charging for the several publications, and dividing these publications into series based upon the subjects of which they treat. In order that due economy shall be exercised in the publication, the committee in charge of each series should receive annually a sum of money proportional to the amount received in subscriptions, which together with the subscription fees should be available for meeting the expense of publication. An arrangement of this kind will, I think, result in having each series appeal to a sufficient constituency to make its publication worth while. I have given some attention to the arrangement of series that you propose. It seems to me that if there is any improvement to be made in your arrangement it would be in decreasing the number of series. I have thought of the following arrangement:

Plant Production (including investigations in soils, plant nutrition and propagation, atmosphere and water).

Plant Life (including anatomy, composition, physiology and pathology).

Principles of Breeding.

Dairy Investigation.

Animal Production (including improvements by breeding, nutrition, care and management).

Veterinary Science (including anatomy, composition, physiology and pathology).

Entomology.

Engineering.

This reduces the number somewhat and includes one subject not included in your classification. I believe that the time has come when we must have technical journals in subjects pertaining to agriculture just as they have in all other branches of scientific work.

Professor J. W. Gilmore writes:

This scheme seems to me eminently feasible and I believe is a distinct step in arranging and systematizing our station literature. I would like to hear a discussion, however, along three lines at least:

1. Scheme of classification.

2. Whether station workers might not receive any or all of the series free on request.

3. What may be the attitude of the now-established scientific journals toward the scheme.

Would it be well to invite discussion along these lines?

The methods and means of publication for scientific station matter is a subject in which all experiment-station investigators are vitally interested, and the writer has thought it desirable to publish his thoughts on the subject, hoping to stimulate a general discussion out of which sentiment may crystallize so that some advanced step may soon be taken by the station authorities.

H. J. Webber

Cornell University

On the Effects of Magnesium Sulphate on Plants

In the issue of Science of August 16, Professor William J. Gies publishes a letter, in which my refutation of an unjust attack is subjected to an analysis which I cannot regard as going to the essential point. I must, therefore, once more and more distinctly state that my inferences as to the *poisonous action* of *magnesium sulphate* on plants can, of course, only relate to the conditions of my experiments and that *I nowhere have made the assertion that these poisonous actions would be observed also at still higher dilutions than those I had used,* for I was very well acquainted with the truth that the action of a poisonous substance decreases with the dilution and that beyond a certain dilution even a stimulating action can take place.

I have further pointed out that the poisonous effects of that salt are modified by the lime content of the cells; the more lime there is present in the cells, the more magnesium sulphate will be required to exert a poisonous action. From this standpoint my own observation on the stimulating action of magnesium sulphate[1] under certain conditions, becomes intelligible.

Oscar Loew

Special Articles

The Spark Chronoscope

Eight years ago I published a description of a new chronoscope in a technical monograph. Eight years of continued use, in which the instrument has been tested for convenience, durability, adaptation and accuracy, give such assurance of satisfaction that I am moved to bring the instrument to the attention of a wider circle of scientists through the columns of this journal. I would especially invite comparison with other instruments on the three fundamental qualities of accuracy, economy in operation and adaptability.

The following brief description is essentially an extract from the original account in *The University of Iowa Studies in Psychology,* Vol. II., p. 155 *ff.*

Of the hitherto known forms of apparatus for measuring short intervals of time, the graphic spark apparatus is the most accurate and the pendulum apparatus the most convenient. In the chronoscope that is shown in the accompanying figure, the spark method of recording is combined with the pendulum action.

The cut is reduced to a scale one sixth of the size of the apparatus. The pendulum is shown in the starting position. The lower bob terminates in a knife edge which rests upon the projecting edge of a mechanical release key. The action of this key is soundless and gives the pendulum no impetus in either direction. On the other side of the apparatus is a spring key which catches the pendulum at the

[1] *Cf.* "Flora," 1893; observations on the growth of the roots of *Tradescantia,* in my article on the "Physiological Functions of Lime and Magnesia."